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Robert A. Malone
Director, Environmental Affairs

May 1, 1984

Kennecott

Ms. Penelope Hansen
Program Manager, Mine Solid Waste
U. S. Environmental Protection Agency
401 M Street SW
Washington, D. C. 20460

Dear Ms. Hansen:

Kennecott's Chino Mines Company was one of the eight selected sites for Phase II of the EPA mine waste studies mandated by Congress. During the course of the study program, Kennecott was given opportunity to comment on the three draft reports which were written by PEDCO and which described the study design, data and results specific to the Chino Lampbright dump leach monitoring program. We have responded to PEDCO with comments for the draft reports dated March and May 1983, respectively. We did not respond to PEDCO regarding the December, 1983 final draft. The reasons for not responding to PEDCO with comments on the December final draft, although invited, are as follows:

- This office did not receive its copy and request from PEDCO until February 16, 1984;

- The PEDCO Draft Final Report (Vols. I, II, III) to EPA for the overall Mine Waste Study, including the Chino site study, was dated December, 1983 and received in this office during late March, 1984;

- Previous <u>substantive</u> technical comments provided by Kennecott to PEDCO on the two earlier drafts were essentially ignored.

Therefore, Kennecott is forwarding to EPA, as an attachment to this letter, pertinent comments concerning the "Site Evaluation, Monitoring of the Lampbright Dump Leach Area at the Chino Mine" by PEDCO Environmental, Inc. dated December, 1983. (EPA Contract 68-03-2900). Many of the comments are repetitive of past submittals. However, we feel that the deficiencies in this study are serious and require careful review and consideration. Because of the technical problems in the study and the potential impact of extrapolation of the improper interpretation of the data and assumptions, Kennecott urges EPA to either repeat the study in a technically appropriate manner or have the study data reanalyzed to develop supportable conclusions.

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In summary, Kennecott believes that the Chino study report suffers from technical inadequacy; is misleading and a misrepresentation of the data; and, does not factually support the contained conclusions and allegations. We urge you to share these comments with Congress at the same time EPA delivers the PEDCO studies to Congress. If, after review of our comments, you have any questions, please contact us at your convenience.

Very truly yours,

R. A. Malone

/mf

cc: R. Dwyer, AMC
Richard Harlen, Dames & Moore
A. V. J. Prather
M. L. Madden
B. Trexler

ATTACHMENT

KENNECOTT COMMENTS
PEDCO Site Evaluation
Lampbright Dump Leach Area
Chino Mines Company

Unless specifically noted, all comments are referenced to the December, 1983 Final Draft Report.

1. Figure 2-1: The map is still in error in terms of the location of the mill, P-Plant, and smelter. Small problem but indicative of the poor quality of the report and PEDCO's knowledge of the site.

2. Paragraph 2.3: "Samples of the wastes at this site, including leach material and leach liquor...." The leach materials and leach water are not wastes. The materials are low grade ores which have not been discarded, disposed of etc.; the qualifications for the definition of waste. The leach water is a process water purposely generated to recover significant quantities of copper metal and is, therefore, not a waste. Any comparisons to solid waste is in error and flagrantly misleading.

3. Paragraph 2.3.1: Since no reference has been established, the use of the terms "high," elevated" and "relatively high" have no meaning and are misleading. These are process waters purposely generated and maintained differently from any water used or potentially used for drinking, irrigation, stock watering etc. in order to achieve recovery of a product. To further point out that copper is "relatively high" in the sense to provoke or imply that the water is contaminated is misleading. Our intention is to increase copper concentrations for higher product recovery.

   The same statement can be made regarding process water when any discussion of corrosivity characteristics of RCRA hazardous waste regulations is made such as represented in this paragraph. It is not a waste and therefore not subject to this comparison until it in fact becomes a waste. The written implication in the report is misleading.

4. Paragraph 2.3.2: "In order to assess potential for waste constituents to enter into solution...," indicates a predetermined hypothesis that all these materials are to be defined as hazardous wastes. We force the metallic constituents to enter into solution. That is the full intent of product recovery from the low grade ore. It makes the first sentence of the paragraph appear a little ridiculous at best.

   It also seems strange that the concentrations of cadmium and selenium are highlighted especially since these concentrations along with the other EP toxicity metals were within established criteria and would not fail the test in the event that the solid materials ultimately would ever need to be tested against the criteria.

5. <u>Section 3:</u> There are many discrepancies between the discussion on well completion in Section Three, Figure 3-2, the field data presented in Appendix A and Appendix B, and the geologic logs presented to CMC from the 1981 drilling. The following Table 1 contains a summary of the discrepancies found in the three different PEDCO reports and geologic logs. When a report contains discrepancies used in calculations, the calculations become suspect and the discrepancies cast doubt on the integrity of the work.

PEDCO and their subcontractor, Gerahty & Miller, need to eliminate all discrepancies before a final report is issued. Copies of the actual field data sheets, not typed office sheets, should be presented in Appendices A and B.

A prime problem is the reported screen lengths with no means to determine the correct screen length. This varies from 25 ft. on Figure 3-2 to "over 20 ft." in Appendix A to 15 ft. in Appendix B. The screen length used to determine hydraulic conductivity (K) from transmissivity (T) is very important, since

$$K = T/\text{screen length}.$$

A 5 ft. error represents a 20% error in K if the correct screen length is 25 ft. Therefore, the 15 ft. screen length used in the calculations could represent a 40% error. The slug method presented by Lohman (1972)[1] calculates T for the screened section of the aquifer.

Similar discrepancies are shown for gravel, cement and bentonite thickness between Figure 3-2 and Appendix A. These should be corrected by going back to the actual field data sheets.

TABLE 1

Discrepancies Between Geologic, Well and Pump Test Logs
as Presented in PEDCO Study

Well #	Data Source	Dimensions in Feet: Total Depth	Screen	Cement	Gravel	Bentonite
GB-001	Fig. 3-2*	52	25	7	45	NM
	A-2*	53	20	8	37	2
	Fig. 3-2**	52	25	7	45	NM
	A-2**	53	20	8	37	2
	Fig. 3-2***	52	25	7	45	NM
	A-2***	52	25	7	45	NM
	1981 Geologic Log	50	NM	NM	NM	NM
GD-001	Fig. 3-2*	58	25	8	50	NM
	A-3*	38	20	8	27	2
	B-2/B-3*	58	15	NM	NM	NM
	Fig. 3-2**	58	25	8	50	NM
	A-3**	38	20	8	27	2
	B-2/B-3**	58	15	NM	NM	NM
	Fig. 3-2**	58	25	8	50	NM
	A-3***	58	25	8	50	NM
	B-2/B-3***	58	15	NM	NM	NM
	1981 Geologic Log	60	NM	NM	NM	NM
GD-002	Fig. 3-2*	50	25	10	40	NM
	A-4*	40	20	8	27	2
	Fig. 3-2**	50	25	10	40	NM
	A-4**	40	20	8	27	2
	Fig. 3-2***	50	25	10	40	NM
	A-4***	50	25	10	40	NM
	1981 Geologic Log	50	NM	NM	NM	NM
GD-003	Fig. 3-2*	41	25	10	31	NM
	A-5*	40	20	8	27	2
	B-4/B-5*	41	15	NM	NM	NM
	Fig. 3-2**	41	25	10	31	NM
	A-5**	40	20	8	27	2
	B-4/B-5**	41	15	NM	NM	NM
	Fig. 3-2***	41	25	10	31	NM
	A-5***	41	25	10	31	NM
	B-4/B-5***	41	15	NM	NM	NM
	1981 Geologic Log	40	NM	NM	NM	NM

NM = Not Mentioned
*March 1983 draft
**May 1983 draft
***December 1983 draft

6. Section 3 and Appendix A: The well logs presented in Appendix A appear to be edited field notes, thereby omitting the accurate field observations. The lithologic log presented on page A-2 for well GB-001 is used as an example for the following comments:

   a. No drilling program is controlled sufficiently to end on a foot mark. Likewise, gravel packs, bentonite plugs and grout plugs also tend to not end on foot marks.

   b. No well log contains statements on measurable items such as "over 20 feet of screen." This quantity should have been measured to the nearest 0.1 of a foot.

   c. On page 4-7, well GB-001 is presented in a geologic cross-section showing several feet of fill overlying quartz diorite. Nowhere on the lithologic log presented in Appendix A is fill discussed. The 1981 typed geologic log is different than the log presented in Appendix A.

   d. References are made on logs for GD-001, 003 and 004 to fractured condition of the rock. A tricone bit and downhole hammer produces such small cuttings that it would be very difficult to determine the presence of fractures. Logs should show how fracturing was determined; i.e., drilling rate, bit chatter, circulation pressure losses, color changes, etc.

   PEDCO should present the actual field logs in the report. If there were later laboratory evaluations of the cuttings, they should be presented in a separate appendix. This is the third time that Kennecott has raised this issue.

7. Paragraph 3.3.1: It is correct that well GB-001 was located adjacent to a fresh water pond. The well was also located adjacent to a process water pond. The fresh water pond only had water in it for a short time during the monitoring program. Assays for the process water pond were provided to PEDCO by Kennecott. Additionally, PEDCO and EPA were urged by Kennecott to drill their GB-001 well further upgradient from the ponds when the well site selection visit was made prior to the start of the program.

8. Paragraph 4.4.2: On pages 4-11 and 4-12, the results of the aquifer tests conducted by Gerahty & Miller, Inc., are presented. After evaluating the questionable well completion data, we contend that the aquifer tests only evaluated the sand used as the gravel pack in GD-001. At the time of the tests, the static water level was at 17.24 ft. and 16.5 ft. (second test), leaving 7.24 to 6.5 ft. of unsaturated gravel pack. A slug of one gallon would only raise the water level in the PVC tube and gravel pack approximately 2.8 ft. Since the clean sand gravel pack is more permeable than the rock, the drawdown measurements from the tube only represented flow into the gravel pack.

In addition, we suggest reading page 27 of Lohman (1972),[1] for the following discussion of the slug method. "The method is strictly applicable only to fully penetrating or fully screened wells in confined aquifers of rather low transmissivity--say less than about 7,000 ft.^{2}/day. For partially penetrating wells, the value of transmissivity obtained generally would apply only to that part of the aquifer in which the well is screened or open. Application of the method to wells in unconfined aquifers would require considerable judgment, and the results should be regarded with skepticism."

The slug tests conducted by PEDCO in GD-003 would apply stress to the rock since the gravel pack was fully saturated as represented by a static water level greater than three ft. above the gravel pack/grout bentonite seal. However, the hydraulic conductivity values calculated and reported in the PEDCO report are in error due to using incorrect screen/open area lengths.

Table 2 summarizes the Kennecott calculated values obtained using the PEDCO reported data and equations presented in NAVFAC DM 7, 1971. The equation used is

$$K = \frac{r^2}{2L} \ln \frac{L}{R} \quad \text{in} \ \frac{(H_1/H_2)}{t_2 - t_1}$$

where R = radius of annular space,
r = radius of piezometer tube,
L = length of saturated zone stressing rock,
H = heads measured in piezometer tube at time (T).

TABLE 2

Summary of Slug Test Hydraulic Conductivity Values for GD-003

L, in ft.	H_1/H_2	$t_2 - t_1$	K ft./sec.	K cm/sec.
31	0.37/0.03	300-90 = 210	4.3×10^{-6}	1.3×10^{-5}
31	0.31/0.265	200-100= 100	5.3×10^{-7}	1.7×10^{-5}
			2.4×10^{-6}	1.5×10^{-5}

Kennecott's packer tests data from 14 cored drill holes at the Lampbright collection dam show average hydraulic conductivities (K) of 5.7×10^{-5} cm/sec (59 ft./yr.). Ten out of 14 holes had measured average K values from 0 to 12 ft./yr. The remaining four holes have a measured average K value of 197 ft./yr.

Any slug tests in this well type design will not stress the actual rock units sufficiently to obtain hydraulic conductivity values. A constant head pump in test through the piezometer with measurements of pressure and water take would stress the rock over the sand packed area. It is suggested that PEDCO have their consultant initiate such a test to get correct hydraulic conductivity data.

9. Paragraph 5.1: "These data were inspected for water quality trends that indicate seepage...." "Identification of such trends..." These statements implying that the study produced results supported by valid data are misleading. The quality of the data is not sufficiently high to make such conclusions.

Comparison of the study data to the primary and secondary drinking water standards to determine an assessment of extent of groundwater degradation and, if no degradation was seen, "to define local ambient water quality" is totally improper and leads to a complete misunderstanding and misinterpretation of the study data. No apparent effort was made to determine the ambient water conditions as published by the State of New Mexico or U.S.G.S. No effort was made to obtain groundwater data from other wells in the area to determine ambient conditions. The primary and secondary drinking water standards enforced by the State of New Mexico and published as representative of the average types of groundwater in the State were ignored. In any case, the PWDS are not a reflection of ambient conditions.

Table 3 is a summary of chemical analysis for wells, springs and rivers from Hydrologic Report #2, 1971. None of these sample points are near any known leach dumps or mine waste yet all show either/or elevated Ca, SO_4 and TDS for many different rock types. These parameters are listed because of the study findings that well GD-003 shows seepage based on these parameters. For comparison purposes, the PEDCO data for well GD-003 are reported as:

	Average	Range
Ca	136	120-150 mg/l
TDS	787	712-826
SO_4	308	275-337

TABLE 3

Chemical Analysis of Water from Wells, Springs and Rivers in Grant County, New Mexico, from Hydrologic Report 2, 1972[2]

Rock Type[3]	Concentrations in mg/l Ca	SO_4	TDS
QTg	22	12	1315
TKa	207	589	1170
IPM	280	778	1360
TKi	288	616	1220
Kc	213	618	1070
Kc	167	351	775
Qal	124	242	595
Tr	312	845	1520
TKa	260	964	1740
Tr	163	91	821
pEg	94	169	586
Qab	44	193	553
Qab	67	208	726
Qab	45	205	685
Qab	31	365	1023
Qab	7	177	607
Qab	12	199	632
Qab	29	206	528
TKh	130	392	955
Qab	43	151	546

Stratigraphic unit: Kc, Colorado Formation; p g, granite and granite-like rocks; M, limestone and shale; Qab, alluvium and bolson deposits; Qal, alluvium; Qtg, Gila Conglomerate; Qtg, terrace gravel; Tba, basalt and basaltic andesite flows; TKa, andesite and related volcanic rocks; TKd, dacite flows; TKh, Hidalgo volcanics; TKi, intrusive rocks; TKr, rhyolite flows; Ti, latite flows; Tr, rhyolite flows; TRp, Rubio Peak Formation; Ts, gravel, sand and tuff. (Reference 3)

10. Paragraph 5.2.1: Last sentence on page 5-4. We have a difficult time in seeing GD-003 as being significantly different than GD-001 and GD-005 or GD-002 and GD-004. There is insufficient data to even establish a true background since all the wells being used are downgradient of the collection dam.

Comparing the five downgradient wells, using Stiff[4] pattern diagrams, shows a similar pattern between GD-001, GD-003 and GD-005 and a similar pattern between GD-002 and GD-004. GD-005 showed the least parallel pattern between GD-001, GD-003, and GD-005. The comparison by PEDCO on page 5-3 using the Student's t-test reached the same conclusion (March 1983 PEDCO report).

Comparing the concentrations of Ca, SO_4, TDS and HCO_3 with time for GD-003 shows a level to slight decline in concentrations. The implication made on pages 5-4 through 5-7 that well GD-003 shows degradation from leach water is unfounded.

The last sentence of 5.2.1, "well GB-001 is not in direct hydraulic connection with the other wells..." has no basis in fact in that PEDCO has presented no data to support the statement.

11. Paragraph 5.2.2. Referring to the sentence on page 5-7, "Water sampled from the freshwater pond adjacent to this well....," the water in this pond cannot be used to determine ambient conditions. It is surface water and has no relationship to groundwater quality (the objective of this study); the surface water in the pond was available for possible influence on the well for only a short time; and, PEDCO completely ignores the presence of the adjacent process water pond, its water quality and its potential impact on the GB-001 well. Also ignored is that the GB-001 well was drilled too close to the dump leach area. PEDCO ignored the pond process water quality data provided to them by Kennecott.

On the same page, the sentence "The quality of water in wells GD-001, GD-002, and GD-005 appears to be more representative of ambient conditions...," is very misleading in that PEDCO apparently did not attempt to determine from other available sources the ambient conditions in the area. This lack of effort is admitted by PEDCO in several places in the report by the references made to define ambient conditions by their own few wells and the primary and secondary drinking water standards.

12. Paragraph 5.2.3: The first sentence is not accurate for well GD-003 based upon the above comments. Well GB-001 is drilled in the leaching area and probably reflects the influence of the adjacent process water pond.

The samples from GD-003 did exceed the federal secondary drinking water standards but did not exceed the New Mexico domestic water supply standards for the same parameters. As stated above, the New Mexico standards are established to reflect a balance between ambient conditions in the state along with human health considerations. In any case, as reported in Table 3, other wells in New Mexico exceed the federal standards. The PEDCO statements are misleading without proper qualification.

The second paragraph has no technical basis to support the migration conclusion. Also it is not surprising that drinking water standards are exceeded because of the well's proximity to the process. The second paragraph should be eliminated from the report.

References

1. Lohman, S. W., 1972, Ground-Water Hydraulics; U.S.G.S. Professional Paper 708, U.S.G.P.O., Washington, D. C.

2. Hydrologic Report #2, 1972, Water Resources and General Geology of Grant County, New Mexico, New Mexico State Bureau of Mines and Mineral Resources.

3. Trauger, F. D., 1971, Water Resources and General Geology of Grant County, New Mexico: Hydrologic Report 2, New Mexico State Bureau of Mines and Mineral Resources.

4. Stiff, H. A., Jr., 1951, The Interpretation of Chemical Water Analysis by Means of Patterns: J. Petroleum Technology, V. 3, No. 10, pp 15-17.